Numerical Criteria

Aquatic Life and Human Health

Summary

- Aquatic Life Criteria
  - Nonylphenol, Diazinon TBT, Cadmium
  Selenium, Silver Ammonia, Copper
- Human Health
  - Background
  - EPA 2000 Human Health Methodology
  - Options on Methodology
  - Other Human Health Criteria (Dioxin, Mercury, Radionuclides, Temperature, Fluoride)

Options for Aquatic Life, cont

- Add Nonylphenol published as EPA 304(a) criteria in 2006
  - FW Acute 28 Chronic 6.6
  - SW Acute 7.0 Chronic 1.7
- Add Diazinon published as EPA 304(a) criteria in 2006
  - FW Acute .17 Chronic .17
  - SW Acute .82 Chronic .82

Options for Aquatic Life

- Revise Cadmium based on EPA 2000 304(a) published criteria
  - Acute 3.9 µg/l to 2.0 at 100 hardness
  - Chronic 1.1 µg/l to .25 at 100 hardness
- Revise TBT based on EPA Dec 2003 304(a) published criteria (non-priority pollutant)
  - Chronic FW .063 µg/l to .072
  - Acute SW .38 µg/l to .42
  - Chronic SW .001 µg/l to .0074

Options for Aquatic Life, cont

- Revise Selenium SW Acute to match EPA 304(a) criteria 300µg/l to 290 to provide 2 significant figures. Selenium is under review by EPA. Do not recommend any other changes at this time.
- Revise Silver FW and SW Acute to match EPA 304(a)
  - Acute FW 3.4 µg/l to 3.2
  - Acute SW 2.0 µg/l to 1.9

Options for Aquatic Life, cont

- Revise Ammonia Criteria for E &T waters critical habitat based on new scientific findings published in Environmental Toxicology and Chemistry, Vol 22, No. 11, pp. 2569 – 2575, 2003, *Water Quality Guidance for Protection of Freshwater Mussels (Unionidae) from Ammonia Exposure*
  - Likely just acute
  - Acute FW 5.62 mg/l to 1.75
  - Chronic FW 1.24 mg/l to 0.30
- Option to require more stringent ammonia (trout present and ELS present to E&T waters) until new criterion published.

Options for Aquatic Life, cont

- Revise Copper criterion for E &T waters critical habitat based on new scientific findings
  - Request from USFWS

Options for Aquatic Life, cont

- No change to duration, return frequency
- Toxics allow at least one excursion every three years (one hit rule Ö)
- Guidance should cover how to sample a four day average
- Phrase ‘on the average’ is EPA recommendation

WQC are also Designed to Protect Human Health

Humans can be exposed to contaminants via:

1. Drinking water (in public water supplies)
2. Ingestion of contaminated fish (in all waters)

These human health WQC are designed to prevent fish contamination beyond a certain level.

Human Health WQC are Calculated by Determining an Acceptable Concentration in Fish Tissue, then Converting this into a Water Column Concentration Using a Bioconcentration Factor

Factors Involved in Calculations

- General values:
- Average body weight
- Average fish ingestion rate
- Average water consumption rate (water supplies only)
- Extra cancer risk (for carcinogens only) (1 in 100,000)

- Contaminant Specific Values:
- Toxicity Value
  - Carcinogen : oral slope factor (q1*)
  - Noncarcinogen: reference dose (RfD)
  - Bioconcentration factor (BCF) for converting fish concentration into a water concentration

EPA Revised Methodology in 2000 Key Differences are:

- 1980 methodology

Fish ingestion rate = 0.0065 kg./day

(about 5.2 pounds/year or about 10.5 eight-ounce meals per year)

Assumed fish to be the only source of exposure to humans.

- 2000 methodology

Fish ingestion rate = 0.0175 kg./day

(about 14 pounds/year or about 28 eight-ounce meals per year)

Relative Source Contribution: Allocates only 20 % of allowable exposure from fish. Assumes 80 % from other food, air etc.

2000 Methodology Results in a Lower Criterion

- Increased fish ingestion rate results in a 63% reduction in criterion concentration
- Relative source contribution results in a further 80 % reduction in criterion concentration

Options for Human Health

1. Revise using 1980 human health methodology but update RfDs,q1*s, BCFs
   - Existing equation is

   (RfD X 70 kg / (2L/day) + [.0065 kg. fish/day X BCF] = WQC (for noncarcinogen)

   10^{-5} X 70 kg / q1*(2L/day + [.0065 kg. fish/day X BCF]) = WQC (for carcinogen)

This would be a less intensive effort.

Options for Human Health, cont..

2. Revise all human health criteria using EPA's 2000 Human Health Methodology
   - More stringent due to higher fish consumption value (17.5 vs 6.5 g/day), Relative source contribution factor to account for non-water sources of exposure for some parameters

Options for Human Health, cont..

3. Revise only the 15 human health criteria published as 304(a) criteria using EPA's 2000 Human Health Methodology
   - Thallium, Cyanide, Chlorobenzene, 1,1-Dichloroethylene, 1,3-Dichloropropene, Ethylbenzene, Toluene, 1,2-Trans-Dichloro-ethylene, Vinyl Chloride, 1,2-Dichlorbenzene, 1,4-Dichlrobenzene, Hexachlorocyclo-pentadiene, 1,2,4-Trichloro-benzene, Gamma-BHC (Lindane), Endrin

Options for Human Health, cont..

4. Revise using 1980 human health methodology but update RfDs,q1*s, BCFs and FI value to match VDH (approx 15 g/day)
   - This eliminates the RSC concerns but puts the FI value close to EPAs' recommendation (17.5 g/day)

Human Health Methodology and Other Near States

State	HH Methodology	15 Published
MD	√	
DE	√	√ (one)
DC	√	√
PA		
WVA		
KY	√	
TN	√	
NC	(under development)	
NJ	√	√ (8)

Options for Human Health Dioxin

- Dioxin clarify it is pico/L
- Dioxin criteria development approved by VDH, EPA and legal ruling in 1990.
- Difference is in choice of q1* and used old methodology

Options for Human Health, cont..

- Mercury Fish Tissue value .30 mg/kg/day
- Delete human health water column numbers
- Add EPA implementation reference?

Other Parameters

- Radionuclides (MCLs)
  - Beta/photon emitters 4 mrem/yr
  - Gross alpha particle 15 pCi/L 0
  - Combined radium 226/228 5 pCi/L
  - Uranium 30 µg/L 0
  - PWS Only?
- Human Health Temperature
- Fluoride (2 mg/L) Secondary MCL